LISTING OF THE CLAIMS

Claims 1 to 6: (canceled).

7 (currently amended): A rolling method for a flat-rolled metal material, for executing rolling by using rolling equipment comprising a rolling mill and a coiling device for coiling a rolled metal material located at an exit side of said rolling mill;

said rolling mill having an upper roll assembly supporting an upper work roll and a lower roll assembly supporting a lower work roll;

either one, or both, of said upper roll assembly and said lower roll assembly comprising a split entry side backup roll split into at least three segments in an axial direction and a split exit side backup roll split into at least three segments in an axial direction;

said entry side split backup roll and said exit side split backup roll each having a construction supporting both vertical direction load and rolling direction load acting on the work roll supported by said entry side split backup roll and said exit side split backup roll;

each segment of said entry side split backup roll and each segment of said exit side split backup roll independently having a load measuring device;

said method comprising the steps of:

calculating a difference Fr^{df} between rolling direction force [[Fr^{W}]] acting on said work rolls at a right side (operator side) of said work rolls and rolling direction force [[Fr^{D}]] acting on said work rolls at a left side (drive side) of said work rolls <u>through the rolled material using imaginary rolling direction force F_R^W and F_R^D acting between the rolled material and the work roll evaluated at the work roll chock position on the operator side and the driving side</u> based on a measured value of backup roll load measured on each segment of

said entry side split backup roll and measured on each segment of said exit side split backup roll by each independent load measuring device and the formula below:

$$F_R^W - F_R^D = (2/a_w)\ \Sigma Z_i q_i \cos\theta_i - (F^W - F^D)$$

responsive to said calculated difference Fr^{df} of rolling direction force, controlling left-right difference of roll gap between said upper work roll and said lower work roll to result in said calculated difference Fr^{df} of rolling direction force approaching zero, wherein:

F_R^W and F_R^D are imaginary rolling direction force when the rolling direction forces acting between the rolled material and the work roll are evaluated at the work roll chock positions on the operator side and the driving side, respectively;

q^i is the measurement value of the ith split backup roll load;

θ_i is an angle between each split backup load operation line direction and the horizontal line (entry side split backup roll has an acute angle and the exit side split backup roll has an obtuse angle);

Z_i is the barrel length center position of each split backup roll expressed by roll axial direction coordinates with a mill center being an origin;

a_w is a center distance between an operator side chock and a driving side chock;

F^W and F^D are the actual values of the horizontal direction roll bending force acting on the work rolls on both operator and driving sides wherein F^W and F^D are omitted when the horizontal roll bending force is not provided.

8 (currently amended): A rolling apparatus for a flat-rolled metal material comprising:

a rolling mill having an upper roll assembly supporting an upper work roll and a lower roll assembly supporting a lower work roll;

either one, or both, of said upper roll assembly and said lower roll assembly comprising a split entry side backup roll split into at least three segments in an axial direction and a split exit side backup roll split into at least three segments in an axial direction;

said entry side split backup roll and said exit side split backup roll each having a construction supporting both vertical direction load and rolling direction load acting on the work roll supported by said entry side split backup roll and said exit side split backup roll;

each segment of said entry side split backup roll and each segment of said exit side split backup roll independently having a load measuring device;

a coiling device for coiling rolled metal material arranged at an exit side of said rolling mill;

a calculating device for calculating a difference Fr^{df} between rolling direction force [[Fr^{w}]]acting on said work rolls at right side (operator side) of said work rolls and rolling direction force [[Fr^{D}]] acting on said work rolls at left side (drive side) of said work rolls through the rolled material using imaginary rolling direction force F_R^W and F_R^D acting between the rolled material and the work roll evaluated at the work roll chock position on the operator side and the driving side based on a measured value of backup roll load measured on each segment of said entry side split backup roll and each segment of said exit side split backup roll by each independent load measuring device and the formula below:

$$F_R^W - F_R^D = (2/a_w)\ \Sigma Z_i q_i \cos\theta_i - (F^W - F^D)$$

another calculating device for calculating a control quantity based on said calculated difference Fr^{df} of the rolling direction force for determining left-right difference of roll gap between said upper work roll and said lower work roll to result in said calculated difference Fr^{df} of the rolling direction force approaching zero;

a control device for controlling said roll gap between said upper work roll and said lower work roll based on said calculated control quantity to set left-right difference in said roll gap between said upper work roll and said lower work roll to result in said calculated difference Fr^{df} of the rolling direction force approaching zero; wherein:

F_R^W and F_R^D are imaginary rolling direction force when the rolling direction forces acting between the rolled material and the work roll are evaluated at the work roll chock positions on the operator side and driving side, respectively;

q_i is the measurement value of the ith split backup roll load;

θ_i is an angle between each split backup roll load operation line direction and the horizontal line (entry side split backup roll has an acute angle and the exit side split backup roll has an acute angle and the exit side split backup roll has an obtuse angle);

Z_i is the barrel length center position of each split backup roll expressed by roll axial direction coordinates with a mill center being an origin;

a_w is a center distance between an operator side chock and a driving side chock;

F^W and F^D are the actual values of the horizontal direction roll bending force acting on the work rolls on both operator and driving sides wherein F^W and F^D are omitted when the horizontal roll bending force is not provided.